Pairing Sesamol With Soybean Oil for Better Frying

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ARS scientists are investigating natural antioxidant compounds that might effectively protect soybean oil from oxidation during frying. In tests with french fries, sesamol, extracted from sesame oil, proved better at this task than a commonly used synthetic antioxidant.

Whether it's spicy stir-fried vegetables from your favorite Chinese restaurant or a crisp, deep-fried chicken from your neighborhood diner, chances are good that both of these foods were prepared using soybean oil. In fact, soy oil makes up an estimated 70 to 80 percent of all cooking oil used commercially in restaurants, bakeries, and more, all across America.

Though it's generally regarded as a healthier choice than edible oils that are higher in saturated fat, soy oil's good-for-you polyunsaturated fatty acids are prone to oxidation at the high temperatures typically used for frying.

Oxidation can make the oil heavy and gummy, lead to off-flavors and odors, and cause the oil to form a messy foam during deep-frying.

These effects may combine to shorten the usable life of the oil, which, in some commercial settings, is reused until health regulations or quality problems dictate discarding it.

Though hydrogenation of the oil at the processing plant will retard oxidation, the procedure creates synthetic *trans*-fats that have been associated with increased risk of cardiovascular disease.

Agricultural Research Service chemist Hong-Sik Hwang, in collaborations with fellow chemists Erica L. Bakota, Mark A. Berhow, Jill K. Winkler-Moser, and research leader Sean X. Liu, is investigating interesting natural antioxidant compounds that might effectively and affordably protect soybean oil from oxidation during frying.

In preliminary experiments at the ARS National Center for Agricultural Utilization Research in Peoria, Illinois, Hwang and colleagues found that sesamol, extracted from sesame oil, provided better antioxidant protection for soy oil than nine other natural antioxidants that they tested.

Followup experiments pitted sesamol against a synthetic antioxidant, TBHQ (*tert*-butylhydroquinone). TBHQ is commonly added to soy cooking oil that's sold in bulk for commercial use, according to Hwang.

In tests with french fries, sesamol—added at the rate of 6,600 parts sesamol per 1 million parts soy oil—provided better protection than TBHQ added at the allowable maximum of 200 parts per million, the team found.

Two well-accepted indicators of oxidation—polymerization of certain soy oil molecules and loss of specific soy-oil protons—were used to evaluate samples of the oil throughout the 8-hour frying test.

More research is needed to ensure that using sesamol at levels that provide antioxidant protection would, at the same time, meet federal GRAS (Generally Recognized As Safe) standards. "Even a natural ingredient such as sesamol has to be evaluated for safety," Hwang notes.

The idea of pairing a sesame seed compound with soybean oil to thwart oxidation isn't new. But the Peoria group is apparently the first to investigate the concept using deep-frying tests that simulate commercial conditions.

Hwang and co-workers are now developing an approach that may enable chefs and fry cooks to automatically add sesamol to soy oil in the right amount at the right times. The tactic helps offset loss of sesamol caused by the compound's own vulnerability to oxidation at high temps. Explains Hwang, "You actually get better results if you make multiple additions of sesamol instead of just adding it all at once."

Peer-reviewed articles published in 2012 and 2013 in the *Journal of the American Oil Chemists' Society* document the research.—By **Marcia Wood,** ARS.

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